

Greetings and welcome to the **JUNE 2016** edition of **the WDFW Climate News Digest**. Our purpose is to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are appreciated – *thanks* to those who have sent links and references and please keep them coming.

Thanks for contributions this month from Dale Swedberg, Cynthia Wilkerson, Wendy Connally, Kirk Lakey, Michael Lekowitz (Ecy) and Dan Siemann, DNR. Other sources for news include: Point Blue Conservation Science, NPLCC Climate Science Digest, Climate.gov, NOAA Climate Newsletter, the DNR e-Mission Control Newsletter, and “BioClimate”, the newsletter of the USGS Climate Science Centers. Contact Lynn if you need information to subscribe directly to any of these.

WHAT’S HAPPENING AT WDFW?

Are you working on a project that may be affected by climate change? Have you considered or included climate change in research proposals, workshops or other activities? Please be in touch to share your news or experience!

Columbia Coast Blueprint – designing a climate-resilient landscape

Cynthia Wilkerson (Wildlife) and Dave Howe (Habitat) are representing WDFW in a multi-stakeholder partnership to develop a “conservation blueprint” for this region; the lower Columbia and the adjacent coasts of Washington and Oregon. This initiative is intended to complement the work of others working within the geographic scope by developing a spatially-explicit conservation design that integrates the goals, conservation priorities, and values of a comprehensive suite of stakeholders – over 50 federal agencies, tribal sovereign nations, state agencies, local governments, nonprofit organizations, members of industry, landowners, community groups, citizens, and other entities are participating and working to collaborate on shared conservation priorities. Climate change and sea level rise are front and center as to the stressors this initiative is addressing. The project is sponsored by the [North Pacific LCC](#).

CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

Administration Proposes 'Bold' Climate Rule for Highways *(from the NPLCC New Digest)*

The Federal Highway Administration is considering the implementation of an unprecedented requirement for state and local transportation officials to record and report their carbon pollution. The conceptually ‘bold’ move would be an attempt to incorporate air quality and societal health into the expectation of planners. According to a ClimateWire news article concerning the proposal, transportation accounts for 26 percent of the country's greenhouse gas emissions and on-road vehicles contribute more than 80 percent of that share. In order for the U.S. to meet the climate goals laid out by international treaties, nationwide transportation will be a critical source of carbon emission reduction.

Department of Ecology considering sea level rise in Shoreline Management rule update

The Department of Ecology is currently updating the rules that implement the Shoreline Management Act (SMA), including the Shoreline Master Program Guidelines (WAC 173-26). Part of Ecology's rulemaking scope is to consider including a new section on planning for sea level rise. On April 1st, Ecology hosted a workshop bringing together key technical experts and select shoreline planners who have been working on addressing sea level rise in Washington.

Read the full post here: <http://www.wacoastalnetwork.com/blog/sea-level-rise-shoreline-master-programs-workshop>

RESOURCES

Tools and Resources for Measuring Blue Carbon

Blue carbon is the carbon sequestered and stored in coastal and marine ecosystems. In particular, tidal marshes, mangroves, and seagrasses extract carbon dioxide (CO₂) from the atmosphere and store carbon within plant biomass. This carbon is eventually transferred to the soil carbon pool, and wetlands that build over time are continually sequestering carbon as they bury old soil with new. When these ecosystems are degraded, the stored carbon can be released into the atmosphere very rapidly. EBM (Ecosystem Based Management) has compiled this list of tools for measuring blue carbon, a critical component of allowing coastal and wetland restoration projects to earn carbon credits.

NOAA Releases Draft of Western Regional Action Plan *(From the NPLCC News Digest)*

The Western Regional Action Plan (WRAP) is a product of the Northwest and Southwest NOAA Fisheries Science Centers that outlines current efforts to increase the production, delivery, and use of climate-related information. The WRAP identifies strengths, weaknesses, priorities, and actions to implement the NOAA Fisheries Climate Science Strategy on the U.S. West Coast over the next 3 - 5 years. [Full Report](#)

Sea Level Rise Modeling Handbook

The USGS has released a resource guide on sea level rise modeling for coastal land managers, engineers, and scientists. The handbook defines, categorizes and builds criteria around the large amount of data, methods, and models concerning hindcasting and forecasting sea-level rise impacts. In doing this, the authors mean to aid in the appropriate application of coastal models for the broad range of disciplines seeking to understand the effects of sea-level rise. Depending on the research question being asked, scientists, land managers and engineers can use this handbook in order to apply the appropriate tools and models with specific parameters, and spatial and temporal scales.

[Short Visual Guide \(Supplement\)](#)

Integrated Scenarios of the Future Northwest Environment website (from the NW Climate Science Center)

This project provides summaries of climate, hydrology, and vegetation model outputs for users. This website has recently been simplified to a more user-friendly format. Check out the new [revamped website](#), which offers a step-by-step guidance tool on using the website's features to answer specific climate questions, technical and non-technical information on the models used, galleries of data and visualization tools, case studies demonstrating how to use Integrated Scenarios outputs, recorded workshop presentations, and more.

National Integrated Heat Health Information System

NIHHIS builds understanding of extreme heat, defines demand for climate services, develops science-based products and services from a sustained climate science research program, and improves capacity, communication, and societal understanding to reduce morbidity and mortality due to extreme heat.

Climate Change Vulnerabilities and Adaptation Options for Forest Vegetation Management in the Northwest

Jessica Halofsky (University of Washington) has published an assessment on the known climate-induced impacts and adaptation policies of forests in the Northwestern U.S. Halofsky and colleagues formed four science-management adaptation partnerships for national parks and forests in the Northwest: The Olympic, North Cascades, Northern Rockies, and Blue Mountains adaptation partnerships. Each partnership evaluated current literature and conducted their own research to determine the region's climate change vulnerabilities. These vulnerability assessments were then used to develop the most appropriate

adaptation strategies for each partnership. The products of each group were given to the national parks and national forests within partnership regions to be used as management tools.

LEARNING OPPORTUNITIES

June 2, 9:00-10:00 a.m., Pacific time, webinar, “Effectively Communicating Climate Change to the American Public: Challenges and Opportunities”, presented by Jennifer R. Marlon, Ph.D., Associate Research Scientist, Yale School of Forestry & Environmental Studies, Yale Program on Climate Change Communication New Haven, CT.

June 2, 10:00-11:00 a.m., Pacific time, webinar: “A Methodology for Assessing the Vulnerability of Fish and Invertebrates to Climate Change”, presented by Wendy Morrison of NOAA. This tool helps identify what fishery resources may be most vulnerable in a changing climate and why. It uses information on species life history characteristics, species distributions and projected future climate and ocean conditions to estimate the relative vulnerability of fish species to changes in abundance or productivity (and to some extent distribution). [Click here to read the methodology report.](#))

June 14-16th, 8:00 am to 3:00 pm daily, online training: Sedimentation Impacts Under Climate Change
The COMET Program and the Climate Change and Water Working Group (CCAWWG) are pleased to announce the second *Sedimentation Impacts Under Climate Change (SIUCC)* course. The course is being offered with financial support from the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation. The SIUCC course is part of Professional Development Series, "Assessing Natural Systems Impacts under Climate Change."

June 15th, 12:30 to 3:00 pm, Washington State Interagency Climate Adaptation Meeting, Room 175 in the Natural Resources Building in Olympia.

This is an informal working group of staff from Washington state agencies who work on climate adaptation. Please feel free to grab lunch and join us if your interest and schedule allows. This meeting will feature presentations by Seattle City Light (Crystal Raymond) and Washington DNR (Dan Siemann) on their recently completed climate adaptation planning and assessment process, including results and lessons learned. This will be an opportunity to compare and contrast approaches to adaptation planning. For a full meeting agenda or for any questions, please contact [Lynn Helbrecht](#)

June 21st, 12:00 pm Pacific time, webinar, “Understanding Water Availability Across Landscapes in a Time of Increasing Drought”.

In this webinar, Jason Dunham from the USGS Forest and Rangeland Ecosystem Science Center will highlight the framework and early results from a new initiative to address the distribution of water across landscapes: WATR (Water Availability and Thermal Regimes). The WATR effort was initiated in the Great Basin of the western United States where limited water availability influences a host of sensitive species ranging from native trout to greater sage-grouse.

Sign up for this webinar to learn more about this initiative at <https://nccwsc.usgs.gov/webinar/water-dunham>.

June 20-24, 2016, “Resilient & Robust Resource Management Course”, Oregon State University - Corvallis, Oregon.

This graduate and post-professional training course in climate adaptation and resource management, with a special emphasis on freshwater is offered by the Alliance for Global Water Adaptation (AGWA). How do we sustain natural resources given a dynamic climate and an uncertain future? The practice of climate adaptation is little more than a decade old, with many elements that are controversial and rapidly evolving.

How does this field align with the science of climate impacts, governance, and management? And how do we practice sustainable resource management if sustainability is a moving target? [Sign up](#) here.

November 14-16th, the 7th Annual Northwest Climate Conference, Skamania Lodge, Stevenson, WA.

The annual NW Climate Conference is the region's premier opportunity for a cross-disciplinary exchange of knowledge and ideas relating to climate impacts and adaptation. The conference brings together up to 400 researchers, resource managers and policy makers from academia, public agencies, sovereign tribal nations, non-governmental organizations, and the private sector, to share the latest climate science, challenges to infrastructure, industry, environment and communities, and adaptive solutions. The call for abstracts will be coming out soon.

WEBINAR RECORDINGS:

- Webinar Recording: **Integrating Climate Change into Design & Permitting Of Water Crossing Structures**
- Webinar recording: **Our Ocean in a High CO2 World: The Latest in Science and Communication**
- Webinar recording: **Big Sagebrush Ecosystem Response to Changing Climate and Disturbance**
- Webinar recording: **Using Resilience and Resistance Concepts to Manage Threats to Sagebrush Ecosystems and Sage-grouse** - Jeanne Chambers, US Forest Service - Rocky Mountain Research Station
- Webinar recording: **Fighting drought with fire: Can forest management increase resistance to drought?**

CLIMATE SCIENCE NEWS

Drought variability in the Pacific Northwest from a 6,000-yr lake sediment record *(from PNAS)*

(excerpt from the abstract) We present a 6,000-yr record of changing water balance in the Pacific Northwest inferred from measurements of carbonate $\delta^{18}\text{O}$ and grayscale on a sediment core collected from Castor Lake, Washington. The results demonstrate that low-frequency drought/pluvial cycles, with occasional long-duration, multidecadal events, are a persistent feature of regional climate. The Castor Lake record also corroborates the notion that the 20th century, prior to recent aridity, was a relatively wet period compared to the last 6,000 yr. Our findings suggest that the hydroclimate response in the Pacific Northwest to future warming will be intimately tied to the impact of warming on the El Niño Southern Oscillation.

May Newsletter – Office of the State Climatologist

The May newsletter is available on our website. Topics include: April climate summary, snowpack update, a note on PDO forecasts, and temperature and precipitation outlooks

El Niño/La Niña update— *(from Climate.Gov)*

There's a 75% chance that La Niña will be in place by the fall, meaning sea surface temperatures in the central Pacific at the equator will be more than 0.5°C below average. It's possible the transition from El Niño to La Niña will be quick, with forecasters slightly favoring La Niña developing this summer.

SPECIES AND HABITATS

Ocean acidification puts Northwest Dungeness crab at risk *(from NOAA)*

Ocean acidification expected to accompany climate change may slow development and reduce survival of the larval stages of Dungeness crab, a key component of the Northwest marine ecosystem and the largest

fishery by revenue on the West Coast, a new study has found. The research by NOAA Fisheries' Northwest Fisheries Science Center in Seattle indicates that the declining pH anticipated in Puget Sound could jeopardize populations of Dungeness crab and put the fishery at risk. The study was recently published in the journal *Marine Biology*

Fuel moisture sensitivity to temperature and precipitation changes – (from *Climatic Change*)

This paper examines the sensitivity of fuel moisture to changes in temperature and precipitation and explores the implications under a future climate. When temperature increases we find that for every degree of warming, precipitation has to increase by 5% to more than 15 % to compensate for the drying caused by warmer temperatures. Results suggest that sensitivity to temperature increases will result in a future with drier fuels and a higher frequency of extreme fire weather days.

Some Tidal Marsh Plants are more Sensitive to Sea-Level Rise – (from the *National Climate Change and Wildlife Science Center*)

Not all coastal wetland plant species respond similarly to flooding, according to a new publication in *Marine Ecology Progress Series* from USGS scientists and collaborators. The researchers' experimental work suggests that the vegetation composition of coastal wetlands plays an important role in determining the effects of sea-level rise on a specific wetland. Accurately understanding these relationships is important for gauging coastal wetland resilience in the face of climate change.

Climate Change Allows Moose to Return to Alaskan Tundra (from *PLOS One*)

Moose are back in the Alaskan tundra after nearly a century away. University of Alaska researchers suggest that climate change may be the cause: Warmer and longer summers have allowed shrubs to grow taller, meaning moose now have ample food for the cold winter periods. This research, published in *PLOS ONE*, is one of the first studies that shows changes in wildlife in response to observed climate and vegetation changes in the Arctic.

Ocean Acidification is being Exacerbated by Local Factors (from the *North Pacific LCC*)

A new report released by the California Ocean Science Trust and written by a panel of 20 scientists from California, Oregon and Washington synthesized our current understanding of how the Puget Sound and other coastal waters along western North America are being impacted by ocean acidification. The report examined local reasons for why the west coast is experiencing exacerbated acidification compared to other oceanic regions.

Drought Rewires Freshwater Food Web Interactions (from the *Nature of Climate Change*)

While drought can deliver major blows to freshwater food webs via loss of key species, these systems may be able to reconfigure and recover, according to a new publication in *Nature Climate Change*. Researchers used a network science approach to investigate the consequences of drought on stream food webs. Drought-simulated conditions triggered a "rewiring" of the interactions between species, creating new, stable food webs.

Adaptive Capacity a Key Component of Conservation Planning (from *USGS*)

By not fully accounting for species' inherent abilities to respond to environmental change (their "adaptive capacity"), scientists may be overestimating some species' extinction potential in response to climate change. In a new publication in *Conservation Letters*, USGS scientists and collaborators argue that consistently considering adaptive capacity could improve climate change vulnerability assessments, adaptation efforts, and management decision making.

Global increase in cephalopods (from *Ars Technica*)

Over the past 60 years, the population of cephalopods—octopuses, squids, and cuttlefish—has been steadily growing. This is particularly remarkable because many types of marine life have been dying out as carbon levels in the oceans rise, making the water more acidic. So even as numbers of crabs, sea stars, and coral reefs are shrinking, the tentacled creatures of the deep are thriving. The question is why. The researchers say it's likely a function of a cephalopod's ability to adapt quickly to a changing ocean environment.

What does the New Normal Mean for the Pacific Arctic's Marine Life? (from [EOS](#))

Climate change has reconfigured Arctic ecosystems. A 5-year project focuses on the relationship among oceanographic conditions and the animals and other life-forms in this region.

Old-growth forests may provide buffer against rising temperatures—*ScienceDaily.Com*

The soaring canopy and dense understory of an old-growth forest could provide a buffer for plants and animals in a warming world, according to a new study.

Hope for Cold-Water Species: Mountain Streams Offer Climate Refuge (from *USGS*)

A new study shows that cold-water mountain streams are warming at a much slower rate than previously forecasted by models, providing hope for cold-dependent species like salmon and trout. The results of this research, published in the *Proceedings of the National Academy of Sciences*, indicate that many cold-water species will continue to persist in mountain streams this century, giving resource managers time to survey these populations and develop conservation strategies. USGS was a partner in this research effort, led by the U.S. Forest Service.

Some Tidal Marsh Plants Are More Sensitive to Sea-Level Rise (from *Marine Ecology Progress Series*)

Not all coastal wetland plant species respond similarly to flooding, according to a new publication in *Marine Ecology Progress Series* from USGS scientists and collaborators. The researchers' experimental work suggests that the vegetation composition of coastal wetlands plays an important role in determining the effects of sea-level rise on a specific wetland. Accurately understanding these relationships is important for gauging coastal wetland resilience in the face of climate change.

Incorporating climate change into spatial conservation prioritisation: A review – (from *Biological Conservation*)

To ensure the long-term persistence of biodiversity, conservation strategies must account for the entire range of climate change impacts. A variety of spatial prioritisation techniques have been developed to incorporate climate change. Here, we provide the first standardised review of these approaches. While there is an increasing trend of incorporating climate change into spatial prioritisation, we found that serious gaps in current methodologies still exist. Future research must focus on developing methodologies that allow planners to incorporate human responses to climate change and recognise that discrete climate impacts (e.g. extreme events), which are increasing in frequency and severity, must be addressed within the spatial prioritisation framework.

Upward shifts in recruitment of high-elevation tree species in the northern Sierra Nevada, California – (from the *California Fish & Game Journal*)

(Excerpt from the abstract): This study compared presence or absence of tree species recruitment in 381 recent random plots in the northern Sierra Nevada of California with 2160 Vegetation Type Map project plots of the 1930s. Of 12 tree species with adequate sample sizes for analysis, we found a significant upward elevation shift in recruitment in three species over this 80-year interval: red fir, western white pine, and mountain hemlock. Because our measure of recruitment integrates over multiple years of seed

germination and seedling and sapling survival, we believe these changes in small trees may reflect ongoing climatic changes in the Sierra Nevada, foreshadowing changes in plant communities and wildlife habitats.

POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION

CLIMATE: Kids win court case forcing Washington emissions plan *(from Greenwire)*

A group of children seeking to force Washington state to adopt more aggressive climate change regulations scored a victory when a state judge ordered regulators to issue a greenhouse gas emissions rule. King County Superior Court Judge Hollis Hill ordered Washington's Department of Ecology to issue an emissions reduction plan by the end of the year. The lawsuit is one of several filed by groups including the Oregon-based Our Children's Trust in state and federal courts across the country. They typically argue that the atmosphere is part of a public trust, and consequently regulators must protect it from climate change for future generations. Their cases have largely been unsuccessful, but they have found a receptive audience in Hill. Last November, she ruled that the state had a "mandatory duty" to protect air quality for future generations. Hill wrote that the children's "very survival depends upon the will of their elders to act now, decisively and unequivocally, to stem the tide of global warming by accelerating the reduction of emission of [greenhouse gases] before doing so becomes first too costly and then too late"

Obama Administration Releases Memorandum on Climate Adaptation Planning *(from the White House)*

OMB Director Shaun Donovan delivered remarks at the United Nations' 2016 Climate Action Summit's session on resilience. On the heels of the Paris Agreement signing ceremony, the Climate Action Summit brought together coalitions of government, business, finance, philanthropy, civil society and academic leaders to strengthen the multi-stakeholder approach to climate implementation. Director Donovan spoke about the importance of a global collective action on resilience, underscoring that one country's failure to adapt to the impact of climate change undermines security and economic stability around the globe.

Federal Flood Maps and Climate Change Risks *(from PBS – Frontline)*

A new Frontline article calls attention to a longstanding issue - many flood plain maps aren't up to date. The article points out that "even the latest maps don't take into account the anticipated effects of climate change, which will dramatically impact the potential for flooding." Fifteen percent of federal flood plain maps date back to the 1970s and 1980s, according to a Frontline analysis of FEMA's map data. The program is up for reauthorization in 2017, which could provide an opportunity for an overhaul of both the program and its mapping policies. [Read the full article](#) and the [previous article in the series](#), which focuses on state and local adaptation efforts with comments from Vicki Arroyo.

The Promise of Climate Fiction *(from the Resilience Alliance)*

["Reimagining Climate Change", edited by Wapner & Elver includes a chapter by Manjana Milkoreit in which she asserts that our failure to effectively address climate change is in large part a failure of our imagination.](#)

Local people's perception of climate change *(from Resilience Alliance).*

Observations of climate change among subsistence-oriented communities around the world by Valentina Savo and colleagues reveals the ways in which climate change is impacting subsistence-oriented communities. The authors note that the extensive observational data is consistent with global modelling but also highlights secondary impacts on ecosystems that pose threats to food security in many communities. Local level data and analyses are needed for community-based adaptation strategies that directly affect people's well-being.

